Request for a New Graduate Certificate Program
Indiana University School of Informatics
IUPUI

Clinical Informatics Certificate

To be offered as a Indiana University Certificate at IUPUI
August 2009

Purpose of the program

There is a growing need for clinical informatics within healthcare organizations. This is especially true for clinical professionals who need a more thorough understanding of information systems technologies, workflow redesign, and engagement strategies for other healthcare professionals. With many hospital systems and physician practices undergoing rapid transitions from traditional paper-based charting systems to using electronic medical records, digital imaging, and more sophisticated diagnostic systems, it is now essential to have clinically-trained professionals who understand these information technologies to assist in their deployment and effective utilization to improve quality and efficiencies within the healthcare system. This program is initially intended for training resident physicians and other healthcare professionals in clinical informatics and preparing them to become knowledgeable about information systems and the deployment of these technologies into their future healthcare organizations and practices.

Relation to existing certificate programs

The Clinical Informatics (CI) certificate program will not compete with any other programs at IU. At the same time, the CI certificate program will leverage the strengths of the graduate degree programs already established in the School of Informatics and other Schools at IUPUI campus. Similar or related programs that exist currently in the US and elsewhere in the world are given in Appendix A.

The target audience

This professional, healthcare-oriented postgraduate certificate program is designed for students with degrees in medicine, nursing, and ancillary healthcare areas who are currently active clinicians. The program seeks to improve knowledge and education in the Health Information Technology trends as well as healthcare transformation for the 21st century.

Thus far, most students in the existing Health Informatics Graduate Program at IUPUI hold full time jobs in IT or related fields and some have clinical backgrounds. The primary target of this program is practicing clinicians who desire to increase their knowledge of HIT systems to improve their current skills and/or to enhance their employment opportunities in healthcare organizations as IT becomes more prevalent in the delivery of care. Hence, the certificate program will initially be for full time clinicians working in local healthcare organizations. At the same time, we plan to leverage our

online HI program so that clinical professionals around the state of Indiana and beyond may take advantage of this unique program. In addition we propose to partner with the American Medical Informatics Association (AMIA) in the AMIA 10x10 program. The program's goal is to train 10,000 health care professionals in applied health and biomedical and health informatics by utilizing curricular content from existing informatics training programs with a special emphasis toward programs with a proven track record in distance learning.

The program consists of 18 credits from which 15 are distance accessible courses and a 3 credits practicum to meet the need of a diverse group of interested students. Graduates from the certificate program will either enhance their current skill set or may choose to continue their learning in the HI Master's Program offered at IUPUI. In either case, certificate seeking students will receive knowledge and skills that are very hands-on and applicable to their particular clinical area and help further promote adoption of HIT in the healthcare professions.

Plan for sustaining steady-state enrollment

In the first year (Fall 2009), ten to fifteen students will likely participate in the program. It is anticipated that this number will rise rapidly to fifteen or twenty per year in the next two to three years, as the awareness of the program increases.

Four to five resident physician students and nurses from St. Vincent Health will likely participate in the program. Other resident physicians/nurses from central Indiana healthcare organizations may bring the number to ten to fifteen total students. The potential exists for much greater growth throughout Indiana if similar programs are offered at IU's regional campuses in Ft. Wayne, South Bend, and Evansville where resident physicians are training and larger healthcare organizations exist.
Partnering with AMIA also will provide a steady enrollment of clinicians.

New resources

No new resources are needed. All courses are currently taught at IUPUI by existing faculty. However, additional full time and adjunct faculty will need to be hired if the program grows beyond our current capacity.

Proposed date of the initiation of the certificate program

Proposed date of implementation is Fall 2009, assuming all necessary approvals have been met.

Person designated as the certificate program head

Mathew Palakal, Associate Dean for Graduate Studies and Research, Indiana University School of Informatics, IUPUI, will provide the school administrative oversight.

Faculty initially involved in the program and their credentials

Josette Jones
Ph.D., University of Wisconsin-Madison, 2002

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Bios: Josette Jones currently teaches Introduction to Nursing and Health Informatics (Spring), Clinical Information Systems (Fall), and Social Impact of Information Technology (Spring). Her area of expertise is Nursing Informatics, more specifically tasks analysis and conceptual design of information systems for health care providers and consumers as well. Dr. Jones goals and intentions are to develop a program of research on "tell and ask functional interfaces" where the user (i.e. nurse, patient, caregiver) communicates with a knowledge base by making logical assertions (tell) and posing questions (ask) based on domain specific knowledge representation, its ontologies, and ontological commitments. A knowledge representation embodies an aspect of the reality, believed to be relevant, attending to some features and processes while ignoring others. Ontology – using a wide variety of languages and notations - represents the content attended to, more specifically the description of the concepts and relationships that can exist for an agent or a community of agents observed. Knowledge representations and their ontologies are developed for the purpose of enabling knowledge sharing and reuse. Ontology, as thus, is a specification used for making ontological commitments. An ontological commitment is an agreement to use a vocabulary and data model in a way that enables information systems to validate and interact with user input conform to domain requirements.

Hadi Kharrazi
Ph.D., Candidate Dalhousie University, 2008
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Bios: Dr. Kharrazi is an Interdisciplinary Medical Informatics Ph.D. Candidate between the faculty of Computer Sciences and the faculty of Medicine at Dalhousie University, Canada. He is a physician and holds a Masters in Health Informatics. He has been a fellow of CHPSTP (Canadian Health Informatics PhD/Postdoc Strategic Training Program) and has won several awards including the prestigious NSHRF and CIHR doctoral awards. Dr. Kharrazi believes that bridging the gaps between medicine and computer sciences requires research in different areas and therefore flexibility in research is an essential characteristic of a medical informatics researcher. His research interests are but not limited to: patient empowerment and behavioral changes in patients by interactive systems, patient centered decision support systems, human computer interaction in medicine and web-based personalized patient health records.

Mahesh Merchant
Ph.D., University of Utah, 1980
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Bios: Before joining Indiana University, Mahesh Merchant was a Senior Research Scientist in the Computer-Aided Drug Discovery group at an international

pharmaceutical organization. He worked with genomic data from the human genome in identifying potential drug targets for the Central Nervous System and Infectious Diseases groups. He developed several databases and data mining tools and integrated a Laboratory Information System for managing the large amount of data generated by microarray experiments across the enterprise. He has gained considerable experience in Validation (GLP, GMP, GxP) while working in a FDA regulated environment. Prior to joining the pharmaceutical organization, he worked at Physio-Control Corporation for 4 years to help develop a multi-lead electrocardiographic system for detection of ischemia and Coronary Artery Disease (CAD). He and his colleagues had developed this system while he held a faculty position at the University of Utah. From 1983 to 1989, he worked as a Software Engineer to develop planetarium systems and high-end flight simulators at Evans and Sutherland in Salt Lake City, Utah. His areas of interest include open source Electronic Medical Records (OpenVISTA); Laboratory Information Systems for the Life Sciences and Healthcare industry; Data Integration and Data Mining in the Life Sciences and Healthcare environment; Validation and Integration of Systems; Spread of Infectious Diseases in Hospitals and communities; Development of Tools and Databases for Microbial Genome Systems.

Mathew Palakal
Ph.D., Concordia University, 1987
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Bios: Dr. Mathew Palakal research interests include Biomedical Text Mining and Intelligent Information Management Systems. Biomedical Texting Mining: The biomedical literature databases continue to grow rapidly with vital information that is important for conducting sound biomedical research. BioMap is an attempt to create a scalable knowledgebase of biological relationships extracted from vast amount of biomedical literature data. The development of BioMap system addresses several innovative research issues related to knowledge discovery from literature documents and real-time, interactive access of this knowledge. Specific problems that are being investigated are: discovering explicit, implicit and directional relationships among biological entities from abstracts and full text documents; discovering both explicit and implicit protein-protein interactions and computationally validating these interactions; and, obtaining novel pathways associated with specific diseases in question. Protein-protein, gene-protein, disease-drug interactions are examples of biological associations that are automatically discovered from large number of literature documents. BioMap can discover interactions in user specified biomedical problem domains such as inflammatory diseases, regenerative biology, cancer, etc., and provide a user-centric view of the knowledge that are discovered. Intelligent Information Management Systems: There is a critical need for innovative information management and knowledge discovery tools to sift through vast volumes of heterogeneous data from various information sources. This project looks into developing Intelligent Software Systems that can integrate information resources and extract embedded knowledge from these information sources.

Gunther Schadow

Ph.D., Free University Berlin, 1998
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Bios: Gunther Schadow received his MD from Humboldt University, Berlin, Germany and his PhD in Medical Informatics from Free University Berlin, Germany. In 1998, he joined the Regenstrief Institute and Indiana University School of Medicine as a Visiting Associate Scientist and since 2000 as Medical Information Scientist. Dr. Schadow has been a leader in healthcare information standards for several years. He has developed most of the clinical side of the HL7 version 3.0 information model in collaboration with other HL7 members who represent the key companies including laboratory and pathology information systems vendors in the medical information system industry. He has also developed a proposed standard for the syntax and semantic of units of measure published in JAMIA, which is now recommended by the U.S. Department for Health and Human Services. He has designed the HL7 version 3 data type specification. He has been co-leading medical device vendors and the FDA on a specification for EKG and other waveform data. He is currently under two contracts with the FDA to design two standards related to drug-knowledge: (1) e-Stability test data submission and (2) Structured Product Labeling (SPL) release 2, which will represent key knowledge in computer-actionable form that can drive decision support functionality in Computerized Physician Order Entry (CPOE) systems. Dr. Schadow has a long-term interest in natural language processing, and has developed a program that extracts and codes specimens and findings on those specimens from pathology text reports. Dr. Schadow has extensive experience in design and implementation of secure Internet communication using SSL and IPsec, and has developed a hardware device to support video conferencing to the homes of on-call physicians. Dr. Schadow joined the School of Informatics to develop the Medical Informatics program beginning November, 2004.

Anna M. McDaniel, DNS RN FAAN
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Bios: Anna McDaniel is a Professor and Assistant Dean for Research, Indiana University School of Nursing. Her program of research in consumer health informatics is characterized by the innovative use of information technology to enhance decision-making by clinicians and to promote positive health decisions by consumers in the area of nicotine dependence. Her most recent study will establish a secure web portal to serve as a platform for translation of evidence-based cancer control behavioral interventions and information dissemination with a team of investigators from the School of Medicine, the IU Simon Cancer Center, and the Informatics Research Institute. She was a founding faculty member of the School of Informatics, the first of its kind in the United States, and served as the director of the health informatics graduate programs (master's and PhD) in that school for the first five years of its existence. Dr. McDaniel's has a strong background and training in informatics (i.e., post-doctoral fellowship at Regenstrief Institute) and she holds numerous leadership positions in nursing and health informatics

(e.g., chair of the NI Research Section of Midwest Nursing Research Society, Expert Panel on Nursing Informatics, American Academy of Nursing, founding faculty of the CIC Nursing and Health Informatics Collaboration, and board member for the Indiana Chapter of HIMSS).

Alan D. Snell, MD, MMM
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Masters Medical Management;Tulane University1999
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Bios: Alan Snell, MD., currently serves as the Chief Medical Informaticist for St. Vincent Health. He previously practiced Family Medicine in South Bend, IN for over 20 years. Dr. Snell also completed a Masters Degree in Medical Management through the American College of Physician Executives and Tulane University School of Public Health in New Orleans. He has lectured at the IUPUI School of Informatics and accepted interns from the graduate program there. In his current position, he is responsible for development and implementation of health information technologies including electronic medical records, physician order entry systems and electronic documentation. He has also introduced web-based Personal Health Records to connect St. Vincent patients electronically with their physicians, hospitals, and other providers. Previously, he served as the Chief Medical Information Officer at St. Joseph Regional Medical Center in South Bend for eight years where he helped develop a community-wide Health Information Exchange and later served as its CEO. He also led efforts to automate over 100 physicians' practices in the South Bend-Mishawaka community.

Robert M. Lubitz, MD, MPH, FACP
St. Vincent Hospital, Indianapolis
Doctor of Medicine, University of Cincinnati School of Medicine, 1987
Masters in Public Health, Indiana University, 1992
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Bios : Dr. Robert Lubitz currently serves as vice president of Academic Affairs and Research with St. Vincent Indianapolis Hospital, the anchor healthcare system of St.Vincent Health. Dr. Lubitz did his undergraduate work at The Ohio State University and is a graduate of the University of Cincinnati College of Medicine. He completed his Internal Medicine Residency at the University of Tennessee, a 3-year Health Services Research Fellowship at Indiana University's Regenstrief Institute for Healthcare, and received a Masters in Public Health from IU in 1992. He remained at Regenstrief through December 1995, doing research and teaching with both inpatient and outpatient electronic health records. Among his many activities since joining the St.Vincent system in January 1996, he co-led the implementation and support of their web-based library information system and their first outpatient electronic health record, and has remained

active in the design of inpatient electronic record systems. He is working with leadership from the Clinical Data Interchange Standards Consortium (CDISC) to explore methods for research data capture from health records. Dr. Lubitz recently completed a 4-year term as president of the American College of Physicians Indiana Chapter, where he represented nearly 3,000 Indiana physicians at the state and federal level on issues germane to the practice of medicine and needs of patients. In this role, he advocated for state and federal support of interoperable electronic health records and personal health records. He is a Volunteer Clinical Professor of Medicine at the IU School of Medicine, adjunct faculty of Purdue University, and sits on several non-profit boards. He is involved in a number of research projects and has received both local and federal research and teaching grants. His professional interests include healthcare access and physician supply, international health needs and state/federal health policy.

Craig J. Wilson, MD, MHSc, FACP
St. Vincent Hospital Indianapolis
Doctor of Medicine; University of Queensland, 1993
Masters of Health Sciences in Clinical Research, 2002
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Bios: Craig Wilson, MD., currently serves as the Director of Internal Medicine at St Vincent Hospital, Indianapolis. In this role, he directs the Internal Medicine Residency Program, regional Hospitalist Service operations for five St. Vincent Health facilities, and presides as Chairman of the Department of Internal Medicine. Following Fellowship training in Geriatric Medicine at Duke University, North Carolina, Dr. Wilson served as co-director of the Institute on Aging at St. Vincent Indianapolis where he also served as Director of the St. Vincent Geriatric Medicine Fellowship. Dr. Wilson completed a Masters Degree in Clinical Research Methodology at Duke University through the Clinical Research Training Program under co-sponsorship through the National Institutes of Health. In his role as Director of Hospitalist Services, he is responsible for systems integration between hospital systems and community-based care providers, and data management to ensure quality oversight. Dr. Wilson has broad interests in clinical, quality improvement, and educational research and is a founding member of the multidisciplinary Research Interest Group at St. Vincent Hospital.

Stephen M. Downs, MD, MS
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Bios: Dr. Downs is the Jean and Jerry Bepko Pediatric Scholar at Indiana University School of Medicine where he is Director of General Pediatrics and Children's Health Services Research. He also directs the Regenstrief Institute Biomedical Informatics Training Program. Dr. Downs received his MD and masters degree in Medical Informatics from Stanford University. He completed his residency in Pediatrics and a Robert Wood Johnson Clinical Scholars fellowship at the University of North Carolina at Chapel Hill. His research interests include computer-based decision support systems for primary care, expected utility theory, decision analysis and cost-effectiveness analysis and their application to guideline development and computer based decision support.

Admissions requirements and procedures

General Admission Requirements for the Graduate Certificate in Resident Clinical Informatics:
Candidates credentialed as a physician, nurse, or ancillary health care providers are eligible to apply for admission. Admission is selective: the Admission Committee evaluates applicants' abilities to succeed academically and their potential to contribute to the program. The certificate degree is designed for students with a bachelor's degree as in an aforementioned discipline who seek additional professional education in informatics to complement this knowledge.

Completion requirements and audit and certification procedures:

General Course Requirements: 18 graduate credit hours are required, including:

- Two core courses (6 credits)
- Three specialization courses (9 credits)
- Practicum (3 credits)

Specific Requirements

Core (6 credits)

- INFO 530 Foundations of Health Informatics
- INFO 581 Health Informatics Standards & Terminology

Clinical Informatics Practicum (3 credits)

- INFO 590 Clinical Informatics Practicum

Specialization (9 credits)

- INFO 505 Informatics Project Management
- INFO 512 Scientific and Clinical Data Management
- INFO 535 Clinical Information Systems
- INFO 578 Data Analysis for Clinical Decision Making
- NURS 630 Introduction to Nursing Informatics
- NURS 635 Consumer Health Informatics
- INFO 641 Business of Health Informatics
- INFO 642 Clinical Decision Support Systems
- INFO 643 Natural Language Processing

Total cr. 18

Minimum overall GPA

Successful completion of the certificate requires at least a B average over all courses counting towards the certificate. Courses with a grade of C or less must be taken again to count towards the certificate. The minimum grade that will be accepted in any single course is C.

In order to be compliant with the guidelines for a AMIA 10x10 course:

1. It should be approximately equivalent in workload and sophistication to 3-credit graduate course (56 CME)

2. It should be delivered primarily via distance learning techniques, complemented with fac-to-face meetings at AMIA symposia and workshops,
3. It should focus on applied clinical informatics.

Maximum number of credits that can be transferred from another institution

Applicants who have already earned credit for one or more of the equivalent courses from other institutions and other certificate programs may request to apply up to a maximum of three credits of these courses toward this certificate. Any waivers or substitutions must to be approved by the committee that oversees the program.

Maximum number of undergraduate courses that can be applied

No undergraduate courses can be applied to this certificate program.

Maximum time for completion

All requirements for the certificate must be completed within three years. Most students enrolled in this program will be part-time students, employed full time. Thus two years may be needed for the completion of all courses if students take one course per semester.

Number of credit hours taken prior to admission to the certificate program that may be counted to completion of the degree

Up to 6 equivalent credit hours taken prior to admission to the certificate program, including 3 hours taken from another institution, will be counted towards the certificate. The rest of the courses must be completed at IUPUI within a three-year period from the time of admission.

Course lists for the program including course descriptions

Foundations of Health Informatics INFO 530 (3 Credits)
This course will introduce the foundation of Health Informatics. It will review how information sciences and computer technology can be applied to enhance research and practice in healthcare. The basic principles of informatics that govern communication systems, clinical decisions, information retrieval, telemedicine, bioinformatics and evidence based medicine will be explored.

Clinical Information Systems INFO 535 (3 Credits)
Clinical Information Systems includes human computer interface and systems design; health care decision support and clinical guidelines; system selection; organizational issues in system integration; project management for information technology change; system evaluation; regulatory policies; impact of the Internet; economic impacts of e-health; and distributed health care information technologies and future trends.

Health Informatics Standards & Terminology INFO 581 (3 Credits)
Health information is captured as data of various formats and types. This course gives an overview of established standards for health care data interchange. The course will expose the principles and methodologies underlying most standards and introduce students to practical issues of reading and understanding specifications, implementing, and translating between standards.

Informatics Project Management INFO 505 (3 Credits)
This is a professional introduction to informatics project management and organizational implementation of integrated information solutions. Through reading, lecture, discussion, practice, and targeted projects, students gain historical perspectives, current awareness, and proficiency with informatics project management terminology, techniques, and technologies.

Scientific and Clinical Data Management INFO 512 (3 Credits)
Management and mining of data generated in scientific laboratories and clinical trials for data mining and knowledge discovery requires robust solutions that include knowledge discovery techniques and databases warehouses. This course introduces students how to implement and manage the vast amount of data generated in a clinical and life sciences setting.

Data Analysis for Clinical and Administrative Decision Making INFO 578 (3 Credits)
Focuses on understanding, manipulating, and analyzing quantitative data in nursing and health care. Includes use of computer-based systems for data management and statistical analysis. Students learn application and interpretation of multivariate statistical models for decision making.

Consumer Health Informatics NURS 635 (3 Credits)
Topics include theoretical models for the delivery of consumer health information; Internet-based information delivery, access to patient information, and privacy issues; quality of consumers health information health literacy; design and development of consumer health information resources; consumer access to clinical information; and current research.

Clinical Decision Support Systems INFO 642 (3 Credits)
This course provides an overview of the state-of-the-art of CDSS (Clinical Decision Support Systems). Topics include: the design principles behind CDSS, mathematical foundations of the knowledge-based systems and pattern recognition systems, clinical vocabularies, legal and ethical issues, patient centered CDSS, and the applications of CDSS in clinical practice.

Natural Language Processing INFO 643 (3 Credits)
This course familiarizes students with applications of the Natural Language Processing and text mining in health care. While the course provides a short introduction to commonly used algorithm, techniques, and software; it focuses on the existing health care

applications including clinical records and narratives, biomedical literature and claims processing.

Business of Health Informatics INFO 641 (3Credits)
This class focuses on the economic importance of healthcare information technology adoption for value realization, as a strategic asset, as an investment, and transformation toward integrated decision making. Topics covered include but are not limited to implementation of Decision Support System, barcode tracking, Electronic Health Records, pay-for-performance, incentives for e-prescribing.

Clinical Informatics Practicum INFO 590 (3 credits)
This course provides an opportunity for students to synthesize previous coursework and to demonstrate beginning competency in clinical informatics. Students will be able to demonstrate comprehension, critical thinking, and problem-solving abilities with concrete applications in the context of a real-world environment in a choice of healthcare organizations.

Program Administration

A committee comprised of Drs. Jones, Merchant, Palakal, and Schadow will jointly oversee the program. All advising will be done by these faculty members. The Office of the Assistant Dean, Mark McCreary, School of Informatics, IUPUI, will take responsibility for all record keeping and tracking of students.

Procedures for program evaluation including the criteria for success

Upon completion of the CI certificate program, exit interviews will be conducted for all students to determine the effectiveness of the program in meeting their needs and to identify how they are using the skills and tools learned in the program in their professions. Follow-up interviews and surveys will be conducted after three years to ascertain what learned skills they are currently using and if they have a designated professional title in the field of informatics. Given the projected enrollment of this program, and the fact that many of the graduates will remain employed locally, it is anticipated that most students will be tracked this way. Success of the program will be defined in terms of demand (enrollment) and the responses of the students surveyed upon completion of their degree and in the follow-up interviews.

APPENDIX A

Health Informatics educational programs (e.g., BS, MS, PhD)

http://www.amia.org/informatics/acad&training/index.asp

AUSTRALIA

1. **Monash University** Melbourne, Australia Graduate Certificate and Graduate Diploma in Health Informatics Graduate Certificate Graduate Diploma in Health Informatics
2. **University of New South Wales Sydney**, Australia Master of Health Informatics PhD in Health Informatics
3. **The University of Sydney Sydney**, Australia
4. **University of Wollongong** Wollongong NSW, Australia Master of Health Informatics

AUSTRIA

1. **University for Health Informatics and Technology Tyrol** (UMIT) Innsbruck, Austria Medical Informatics BSc in Medical Informatics MSc in Medical Informatics PhD in Medical Informatics

BRAZIL

1. **Federal University of São Paulo São Paulo,** Brazil Master of Health Informatics PhD in Health Informatics
2. **Marilia Medical School Marilla**, Estate of Sao Paulo, Brazil Medical Course undergraduate medical course
3. **Universidade Federal de Pernambuco** (UFPE) (Federal University of Pernambuco) Grupo de Tecnologias da Informação em Saúde (TIS) (Health Information Technology Group) Recife-PE, Brazil

CANADA

1. **Dalhousie University Halifax**, Nova Scotia, Canada
2. **Queen's University Kingston**, Ontario, Canada
3. **University of Victoria Victoria**, British Columbia, Canada Health Information Science
4. **University of Waterloo Waterloo**, Ontario, Canada

CUBA

1. **Instituto Superior de Ciencias Médicas de La Habana** (ISCM-H) La Habana, Cuba Master in Health Informatics

GERMANY

1. **Georg-August-University** Goettingen Applied Informatics / Health Information Officer Goettingen, Germany BSc MSc in Medical Informatics

2. **University of Essen** Essen, Germany Medizin-Management with Informatics specialization **University at Leipzig**/Germany Leipzig, Germany Institute for Formal Ontology and Medical Informationscience (IFOMIS)

GREECE

1. **National and Kapodistrian University of Athens** Athens, Greece Health Informatics

IRELAND

1. **Trinity College Dublin Dublin**, Ireland MSc in Health Informatics

THE NETHERLANDS

1. **Erasmus University Rotterdam Rotterdam**, The Netherlands Erasmus Medical Center Rotterdam Master of Health Information Management
2. **University of Amsterdam** Amsterdam, The Netherlands Medical Information Sciences

PERU

1. **Instituto de Medicine Tropical Alexander Von Humbold Universidad Peruana Cayetano Heredai** Lima, Peru Health Informatics Telemedicine

SOUTH AFRICA

1. **Stanford**-South Africa Biomedical Informatics Program Stanford-South Africa Biomedical Informatics Program Participating institutions: South African National Bioinformatics Institute, **University of the Western Cape**, Belleville, South Africa University of Cape Town, Cape Town, South Africa National Institute for Communicable Diseases, Johannesburg, South Africa

SWEDEN

1. **Uppsala University** Uppsala, Sweden

UNITED KINGDOM

1. **Centre for Health Informatics & Multiprofessional Education** (CHIME) London, United Kingdom**Imperial College** London, United Kingdom MSc in Health Informatics and Management
2. **King Alfred's Winchester** Winchester, United Kingdom
3. **St George's, University of London** London, United Kingdom BSc Biomedical Informatics
4. **University College London** London, England, United Kingdom
5. **University of Edinburgh** Edinburgh, United Kingdom School of Informatics Specialism in Bioinformatics
6. **University of Sheffield Sheffield**, United Kingdom
7. **University of Wales Swansea Swansea**, Wales, United Kingdom

USA

1. **Arizona School of Health Sciences**, Mesa, Arizona

2. **Arizona State University**, Tempe, Arizona Department of Biomedical Informatics
3. **Brigham and Women's Hospital**, Boston, MA Pharmacy Fellowship in Outcomes Research/Informatics
4. **Centers for Disease Contro**l, Atlanta, GA Public Health Informatics Fellowship Program (Epidemiology Program Office)
5. **Cleveland Clinic**, Cleveland, OH Medical Informatics Fellowship (Division of Medicine/ Department of General Internal Medicine)
6. **College of St. Scholastica**, Duluth, MN Health Informatics
7. **Columbia University**, New York, NY Biomedical Informatics (Graduate School of Arts and Sciences) Intensive Course in Biomedical Informatics
8. **Dalhousie University**, Halifax, Nova Scotia, CANADA
9. **Duke University**, Durham, NC Clinical Informatics (Department of Community and Family medicine/Division of Medical Informatics) Nursing Informatics (School of Nursing)
10. **East Carolina University**, Greenville, NC The Brody School of Medicine, Telemedicine Center Advanced Telemedicine Training
11. **Eastern University**, St. Davids, PA The Campolo College of Graduate and Professional Studies Nursing Informatics Certificate Program
12. **Emory University**, Atlanta, GA Department of Biostatistics MSPH Program in Public Health Informatics
13. **Excelsior College**, Albany, NY Clinical Systems Management/Health Care Informatics (Graduate and Certificate Programs in Nursing and Allied Health)
14. **George Mason University**, Fairfax, VA School of Computational Sciences (Bioinformatics Programs) Department of Health Administration and Policy
15. **Washington University Medical Center**, Washington, DC School of Public Health and Health Services
16. **Grand Valley State University**, Allendale, Michigan School of Computing and Information Systems
17. **Harvard Medical School**, Boston,MA Center for Clinical Computing (Beth Israel Deaconess Medical Center)
18. **Brigham & Women's Hospital/Harvard Medical School**, Boston, MA Decision Systems Group (Brigham and Women's Hospital)
19. **Massachusetts General Hospital/ Harvard Medical School,** Boston, MA Laboratory of Computer Science (Massachusetts General Hospital)
20. **Harvard-MIT-NEMC Research Training Program**, Boston, MA Joint Division of Health Sciences & Technology (Decision Systems Group - Brigham and Women's Hospital) (Children's Hospital Informatics Program - Childrens Hosp. Med Ctr.) (Center for Clinical Computing, Beth Israel Deaconess Med Ctr.) (Laboratory of Computer Science - Mass. General Hospital) (Division of Clinical Decision Making, Informatics and Telemedicine - New England Medical Center) (Medical Computer Science - Massachusetts Institute of Technology)
21. **Johns Hopkins University**, Baltimore, MD
22. **Medical College of Georgia**, Augusta, GA
23. **New Jersey Institute of Technology**, Newark, NJ

24. **University of Medicine and Dentistry in New Jersey**, Newark, NJ Nursing Informatics
25. **Indiana University**, Indianapolis, IN School of Informatics School of Informatics - Bioinformatics/Chemical Informatics/Human-computer Interaction School of Medicine - Gero-informatics
26. **Loyola University Chicago**, Chicago, IL
27. **Massachusetts Institute of Technology**, Cambridge, MA Clinical Decision Making Group (Laboratory for Computer Science/Harvard-MIT Division of Health Sciences and Technology)
28. **Medical College of Wisconsin and the Milwaukee School of Engineering**, Milwaukee, WI Medical Informatics
29. **Montana Tech/University of Montana**, Butte, Montana Medical Informatics (College of Math and Sciences)
30. **Mount Sinai-NYU Health System**, New York, NY Medical Informatics (Division of Clinical Informatics Mount Sinai-NYU Health System IT and Center for Medical informatics-Dept of Medicine, Mount Sinai)
31. **National Library of Medicine**, Bethesda, MD Medical Informatics Training Program (Lister Hill National Center for Biomedical Communications)
32. **New England Medical Center / Tufts University**, Boston, MA Division of Clinical Decision Making, Informatics and Telemedicine (Department of Medicine)
33. **New York University**, New York, NY Nursing Informatics (Division of Nursing)
34. **Northeastern University**, Boston, MA (College of Health Sciences and College of Northwestern University, Evanston, IL (School of Continuing Studies)
35. **Nova Southeastern University**, Ft. Lauderdale, FL (College of Osteopathic Medicine)
36. Oregon Health and Science University, Portland, OR Department of Medical Informatics & Clinical Epidemiology (School of Medicine and Biomedical Information Comm Ctr)
37. **Oregon Institute of Technology**, Portland, OR (School of Engineering, Technology and Management)
38. **Pace University**, New York City, NY, Westchester, NY Lienhard School of Nursing
39. **Philadelphia VA Center for Health Equity Research and Promotion** (CHERP), Philadelphia, PA Medical Informatics Fellowship
40. **Queen's University**, Kingston, Ontario, Canada (School of Computing)
41. **Regenstrief Institute for Health Care**, Indianapolis, IN Medical Informatics Fellowship (Indiana University School of Medicine)
42. **Saint Louis University**, St. Louis, MO Nursing Informatics (School of Nursing)
43. **Stanford University**, Stanford, CA Biomedical Informatics Training Program (School of Medicine)
44. **State University of New York**, Brooklyn, NY Medical Informatics
45. **Touro University International**, Cypress, CA
46. **University of Alabama at Birmingham**, Birmingham, AL Health Informatics Program (Dept. of Health Services Administration)

47. **University of Arizona**, Tucson, AZ Systems Management / Informatics (College of Nursing)
48. **University of California** - Davis, Davis, CA Health Informatics Program
49. **University of California** - Irvine, Irvine, CA Informatics in Biology and Medicine (Department of Information & Computer Science)
50. **University of California** - Los Angeles, Los Angeles, CA Medical Imaging Informatics Biomedical Engineering
51. **University of California** - San Francisco, San Francisco, CA Biological and Medical Informatics
52. **University of Colorado Health Sciences Center**, Denver, CO Health Care Informatics (School of Nursing)
53. **University of Kansas**, Kansas City, KS (School of Nursing)
54. **University of Illinois at Chicago**, Chicago, IL Biomedical and Health Information Sciences (College of Applied Health Sciences) School of Public Health
55. **University of Iowa**, Iowa City, IA Nursing Informatics (College of Nursing)
56. **University of Maryland**, Baltimore, MD Nursing Informatics (School of Nursing)
57. **University of Maryland College Park**, College Park, MD Department of Public and Community Health University College
58. **University of Medicine and Dentistry in New Jersey**, Newark, NJ Department of Health Informatics
59. **University of Medicine and Dentistry in New Jersey**, Newark, NJ New Jersey Institute of Technology, Newark, NJ Nursing Informatics (School of Health Related Professions)
60. **University of Miami**, Miami, FL Medical Informatics
61. **University of Michigan**, Ann Arbor, MI School of Dentistry
62. **University of Michigan Health Center**, Ann Arbor, MI (Department of Pharmacy Services)
63. **University of Minnesota**, Minneapolis, MN Health Informatics (Division of Health Computer Sciences)
64. **University of Missouri**, Columbia, MO Health Management and Informatics (School of Medicine)
65. **University of Nebraska Medical Center**, Omaha, NE College of NursingMedical Sciences Interdisciplinary Area (MSIA)
66. **University of New Mexico**, Albuquerque, NM Health Sciences Library and Informatics Center
67. **University of North Carolina**, Chapel Hill, NC Division of Medical Computing and Informatics (School of Medicine, Biomedical Engineering)
68. **University of Pittsburgh**, Pittsburgh, PA Pittsburgh Bio-medical Informatics Training Program Nursing Informatics Dental Informatics
69. **University of Sydney**, Sydney, Australia Dental Informatics
70. **University of South Florida**, Tampa, FL College of Nursing
71. **University of Tennessee Health Science Center**, Memphis, TN Health Informatics & Information Management

72. **University of Texas Houston Health Science Center**, Houston, TX Health Informatics (School of Health Information Sciences)
73. **University of Utah, Salt Lake City**, UT Department of Biomedical Informatics (School of Medicine)
74. **University of Utah**, Salt Lake City, UT Clinical Informatics (College of Nursing)
75. **University of Victoria**, Victoria, BC Health Information Science (School of Health Information Science)
76. **University of Virginia**, Charlottesville, VA Health Evaluation Sciences Department of Systems and Information Engineering
77. **University of Washington**, Seattle, WA Department of Medical Education and Biomedical Informatics (Division of Biomedical & Health Informatics)
78. **University of West Florida**, Pensacola, FL Medical Informatics Program School of Allied Health and Life Sciences
79. **University of Wisconsin**, Madison, WI Department of Biostatistics & Medical Informatics (Medical School)
80. **University of Wisconsin** - Milwaukee, Milwaukee, WI Interdisciplinary Program Health Care Informatics Medical Informatics
81. **Vanderbilt University**, Nashville, TN Bioinformatics Programming (Vanderbilt University Medical Center)
82. **Yale University** , New Haven, CT Center for Medical Informatics (School of Medicine)

Regenstrief Institute
Advancing health care through
research, development and education.

December 10, 2008

Mathew Palakal, Ph.D.
Associate Dean, Graduate Studies and Research
Director, Informatics Research Institute
Indiana University School of Informatics at IUPUI
535 West Michigan Street, Room IT 475
Indianapolis, IN 46202-3103

Dear Mathew:

Please accept this letter as an indication of my complete support for your proposed Clinical Informatics Certificate program. As one of the recognized national leaders in clinical informatics, Regenstrief Institute is well positioned to collaborate with you in insuring that those in this program receive appropriate exposure to the disparate facets of clinical informatics.

This program integrates well with many of our current medical informatics educational opportunities, both those in which we collaborate and those sponsored solely by the IU School of Medicine. I can certainly see this program as a potential feeder for our post-doctoral fellowship program if, as you anticipate, your target students are comprised of practicing health care professionals, particularly physicians.

There is a dearth of clinicians across the country that have the skills necessary to meet the challenges of the growing demand to automate practices, particularly in the area of electronic medical records and decision support. The Joint Commission on the Accreditation of Health Care Organizations has written this need into their recent accreditation guidelines. The American Medical Informatics Association has created its 10x10 initiative that is calling for 10,000 informatics trained clinicians by 2010. Congressman Wu has even introduced legislation in support of clinical informatics workforce issues. Your proposal is extremely timely.

From a pragmatic side, I also see this certificate program as a nice segue into your Master's program, which then leads into your Ph.D. program, something in which we are quite involved. The ability to leverage not only faculty but clinical informatics projects for the benefit of the students promises a grounded experience that will translate into more sustained educational outcomes when the skills are put into practice.

Again, I am delighted to support this program, and please let me know what I can do to help facilitate its approval.

Sincerely,

J. Marc Overhage, MD, PhD
Director of Medical Informatics, Regenstrief Institute
Regenstrief Professor of Medicine, IU School of Medicine

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INDIANA UNIVERSITY
SCHOOL OF MEDICINE
Graduate Division

Mathew Palakal, Ph.D.
Associate Dean, Graduate Studies
Research Director, Informatics Research Institute
IU School of Informatics, IUPUI

November 8, 2007

Dear Mathew,

I have read your interesting proposal for a new graduate certificate program in Clinical Informatics at the Indiana University School of Informatics, IUPUI. I think that your proposal describes a program that will fill a required need as exemplified by the strong support from local institutions such as St. Vincent's.

This letter confirms that the IU School of Medicine has no objections to this proposed certificate program. Further, trainees in the IUSM residency program might also find this program interesting and might benefit from taking it.

Yours sincerely,

Simon J. Rhodes, Ph.D.
Associate Dean for Graduate Studies
Indiana University School of Medicine
srhodes@iupui.edu

INDIANA UNIVERSITY
SCHOOL OF NURSING
Office of the Executive Associate Dean
for Academic Affairs

November 6, 2008

Mathew Palakal, PhD
Associate Dean for Research and Graduate Programs
School of Informatics
Indiana University

Dear Dean Palakal:

As Executive Associate Dean for Academic Affairs at the School of Nursing, I am pleased to write in support of your proposal to offer a certificate program in Clinical Informatics. I have reviewed the proposal and believe no conflicts exist with our current certificate in nursing informatics. Although some nurses may participate the program, the focus is clearly distinct from our nursing informatics certificate program. In addition, nurses would be able to enroll in courses offered by our school as electives in the clinical informatics certificate program. The School of Nursing welcomes the opportunity to collaborate in this manner.

Thank you for the opportunity to review the proposal. We look forward to continued collaboration between our schools.

Sincerely,

Judith A. Halstead

Judith A. Halstead, DNS, RN, ANEF

Hancock Regional Hospital

November 21, 2008

Indiana University-Purdue University Indianapolis
Academic Program Evaluation Committee

Re: Proposed Clinical Informatics Certificate

Dear Faculty and Administrative Members,

I am pleased to write this letter in support of the proposal for a new Certificate Degree program in Clinical Informatics. There is an acute need for highly skilled and qualified clinical professionals to improve patient safety and clinical outcomes in health care. The challenge is to conceptualize and pilot new approaches to improving access, quality and safety, aligning physicians with local health providers and incorporating them into a collaborative care model. Clinical informatics provides a means to accomplish these goals, by automating clinical processes, enhancing efficiency, and allowing us to work in teams to develop and deliver safe patient care. Training providers in clinical informatics and having them drive the change process will be a tremendous asset for healthcare institutions as we move our workflows and processes of care into the electronic world.

I embrace this innovative educational program that allows residents, medical staff, nurses, and other clinicians to remain in their full-time roles while pursuing additional technical and management skills in clinical informatics.

We appreciate the leadership that Dr. Alan Snell, Chief Medical Informaticist at St. Vincent is providing to these efforts. We would be happy to support these efforts in any way possible.

I appreciate the efforts of the IUPUI Administration and the School of Informatics in providing this most valuable educational program.

Sincerely,

Robert C. Keen, Ph.D., FACHE
President and CEO

c: Dr. Alan Snell

801 North State St.
Greenfield, IN 46140

Phone (317) 462.5544

Alverno Information Services
A Division of the Sisters of St. Francis Health Services, Inc.

November 14, 2008

Dr. Mathew Palakal, Chair
Academic Program Evaluation Committee
Indiana University-Purdue University Indianapolis
719 Indiana Avenue
WK 305
Indianapolis, IN 46202-3103

Re: Proposed Clinical Informatics Certificate

Dear Dr. Palakal:

It is my pleasure to write this letter of support of the proposal for a new Certificate Degree program in Clinical Informatics. In fact, I am very excited to hear that an Indiana institution is considering this type of program. In my work as a physician informaticist for the Sisters of St. Francis Health Services, Inc., I am very much aware of the national shortage of clinicians formally trained and skilled in the growing field of clinical informatics.

Within our organization the rate of investment in advanced clinical information systems has increased each year and is likely to do so over the next decade. To successfully implement and achieve adoption of advanced clinical systems requires clinicians skilled in informatics to provide leadership. I believe that the proposed informatics certificate degree curriculum will provide the kind of practical opportunity for organizations like SSFHS to recruit physicians, residents, nurses, and other clinicians to be trained in the field of clinical informatics, so they can assist us in our transformation to an advanced electronic health record environment.

As a physician who has spent the last 20+ years doing clinical informatics activities, I welcome the opportunity to expand the number of clinicians in Indiana who have the necessary training, skills, and desire to support the growing field of clinical informatics.

Sincerely,

Jonathan R. Roskam, MD MBA
Physician Informaticist
Sisters of St. Francis Health Services, Inc.

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November 3, 2008

8425 Harcourt Road
Indianapolis, IN
46260

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Indiana University-Purdue University Indianapolis
Academic Program Evaluation Committee

Re: Proposed Clinical Informatics Certificate

Dear Faculty and Administrative Members,

I am pleased to write this letter in support of the proposal for a new Certificate Degree program in Clinical Informatics. There is an acute need for highly skilled and qualified clinical professionals to improve patient safety and clinical outcomes in health care. The challenge is to conceptualize and pilot new approaches to improving access, quality and safety, aligning physicians with local health ministries and incorporating them into a collaborative care model. Clinical informatics provides a means to accomplish these goals, by automating clinical processes, enhancing efficiency, and allow us to work in teams to develop and deliver safe patient care. Training providers in clinical informatics and having them drive the change process will be a tremendous asset for healthcare institutions as we move our workflows and processes of care into the electronic world.

I embrace this innovative educational program that allows our residents, medical staff, nurses, and other clinicians to remain in their full-time roles while pursuing additional technical and management skills in clinical informatics. Under the leadership of Dr. Alan Snell, St. Vincent Health-Chief Medical Informaticist, and Dr. Robert Lubitz, St. Vincent Hospitals and Health Services-Vice President of Academic Affairs and Research, we will assist in identifying and recruiting clinicians as students for this new program. We will also encourage those students to continue their pursuit of higher education toward a Masters or Doctoral degree, if desired. At St. Vincent Health, we provide a tuition reimbursement program for all full-time associates that will assist them financially in obtaining this additional training.

I appreciate the efforts of the IUPUI Administration and the School of Informatics in providing this most valuable educational program.

Sincerely,

Vincent C. Caponi

Vincent C. Caponi
CEO